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ABSTRACT

The results of a series of investigations into the effect on children's learning and recall of interest are summarized in this report. The report describes investigations using sentences, showing that interest has a pervasive effect on learning that is independent of the relationship between attention and learning. It then presents two compatible theories of interest--one dealing with what makes sentences interesting and one concerning story interest. Finally, the report comments on the contrast between the "interestingness" of children's trade books on the one hand and their basal readers and content area textbooks on the other, concluding that schools should promote the reading of trade books as part of the curriculum. (Author/FL)

CENTER FOR THE STUDY OF READING

Technical Report No. 323

INTERESTINGNESS OF CHILDREN'S READING MATERIAL

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Abstract

This paper summarizes the results of a series of investigations into the interestingness of children's reading material. First, we describe our own investigations using sentences, which show that interest has a pervasive effect on learning that is independent of the relationship between attention and learning. Next, we present two compatible theories of interest: our theory of what makes sentences interesting and a theory of story interest. Finally, we comment on the contrast between the interestingness of children's trade books on the one hand and their basal readers and content area textbooks on the other. A major educational implication of this research on interest is that schools should promote the reading of trade books as part of the curriculum.

Interestingness of Children's Reading Material

> Present interest, that is the motive power, the only motive power that takes us far and safely (Rousseau, Emile, 1762, trans. 1914, p. 81).

While it would not come as a surprise to school teachers or librarians, we were surprised when we stumbled upon the powerful effects of interest on children's learning and recall of sentences. We noticed that sentences such as The fat waitress poured the coffee into the cup were recalled by very few children, whereas sentences such as The huge gorilla smashed the schoolbus with his fist were recalled by almost all of them. This led us to a systematic exploration of the nature, extent, and generality of this effect, and the reasons for it.

This paper is organized as follows. We will first characterize the size and generality of the effects of interest on learning. Next, we will describe some research that evaluates a simple model of how interest relates to learning. Then, we will consider a theory of what makes sentences interesting and a theory of story interest. Finally, we will comment briefly on the interestingness of social studies and science textbooks intended for children.

Size and Generality of Interest Effects

We have included interest as a factor in several experiments now involving over four hundred third and fourth graders. In two of these studies, interest was the main factor and in two other

studies it was an additional factor included to explore relationships (see Anderson, Mason, & Shirey, in press). This set of experiments involved lists of sentences that had been rated for interestingness by other groups of children. The measure of learning was cued recall shortly after reading the sentences once. The subject noun phrase of each sentence served as the cue and the children were asked for oral recall of the rest of the sentence. Sentence recall was scored according to gist criteria.

One way to evaluate the size of an effect is to compare it with a variable of known influence. In the four experiments, rated interest accounted for an average of thirty times as much variance in sentence recall as readability, the criterion used throughout the country for grading the appropriateness of school reading materials. We wish to emphasize that in these experiments the range of readability was not constrained. According to the Fry (1977) readability scale the sentences ranged in difficulty from first to seventh grade. We should add, though, that under most of the conditions in these studies there was a teacher or research assistant available to help the children with the hard words.

Another benchmark against which we can gauge the influence of interest is a standardized measure of the children's reading comprehension. Again, we want to emphasize that in these studies there was no truncation in range of reading ability. Indeed, in

the largest experiment, the mean and standard deviation of the sample matched that of the nation at large. Nonetheless, interest accounted for about the same amount of total variance in recall as did the reading comprehension scores of the children.

Strong effects of interest were observed under a variety of conditions. In these experiments, some children read silently, some listened, some read aloud with an emphasis on accurate oral reading, and some read under conditions where they were expected to compose a continuation sentence that told what might happen next. Some children read in individual experimental settings; some read from computer terminals while also performing a secondary task. Perhaps most interesting of all, in the largest experiment, we simulated reading instruction as it occurs in most primary school classrooms in this nation. The children were instructed in groups and took turns reading the sentences aloud. Under all of these conditions interest has shown very strong effects.

Interest does not interact with very many other factors. In these experiments a large number of factors have been included. We've always looked for interactions. With one exception, which we will describe in a moment, we have not found them. In particular, there was no interaction with a depth-of-processing manipulation that involved an emphasis on either accurate, fluent oral reading or providing a continuation that told what might happen next. Nor did interest interact in the simulated reading

group study with whether or not the child was playing the active or passive role--that is, whether the child was the one reading a certain sentence aloud and receiving feedback and questions from the teacher or was one of the children reading silently and following along. Both the depth-of-processing manipulation and the role the child was playing in the reading group had large effects on recall, but neither interacted with interest.

Just one replicable interaction involving interest appeared in these four experiments. The sentences were composed to vary systematically in how interesting they were to boys and girls. Some sentences, such as The crowded schoolyard was full of girls waiting for the jump-rope contest, were highly interesting to girls. Some, such as Green blood squirted out when the boy shot the arrow through the monster's head, were highly interesting to boys. Other sentences were interesting to both boys and girls, for example, The hungry children were in the kitchen helping mother make donuts. Finally, there were sentences interesting to neither boys nor girls, such as, The old shoes lay in the back of the closet.

The differential interest of the sentences to boys and girls interacted with the sex of the child: Boys learned more of the sentences rated as interesting by boys; girls learned more of the sentences rated as interesting by girls. We also found that the effects of interest are stronger for boys than for girls. Girls show less peaking of recall on high-interest sentences and

do better on low-interest sentences than boys. Boys do very badly on sentences that are uninteresting to them and extremely well on sentences they find interesting. These findings replicate those of Asher (1980) and his associates who used entirely different methods. One caveat: while there is some stereotyping of interests by sex, we have included sex in this research as a placeholder for what we assume is a variegated range of interests specific to individual children.

Other investigators, notably Asher and his colleagues (see Asher, 1980) and Estes and Vaughan (1973), have found strong effects of interest on learning from connected text. A criticism of these studies is that people may be interested in topics they know a lot about and that it may have been knowledge of the topic, instead of interest, that led to increased learning. Our research on sentence interest and learning is less vulnerable to any criticism along the lines that the relationship observed was really due to greater topic knowledge, greater familiarity, or greater semantic integration, a point to which we will return later. In the meantime, the fact that interest is associated with increased learning from text adds to the prima facie case that interest has pervasive effects.

Does Interest Increase Learning by Attracting Attention?

The next task that our research team set for itself was to try to determine why it is that interest profoundly affects the learning of sentences. A theory that would seem plausible to

both information-processing psychologists and school teachers is that interest attracts attention; and attention, or a process supported by attention, leads to superior learning. This model can be diagrammed as follows:

Interest --> Attention --> Learning

The model was evaluated in two experiments in which children read sentences varying widely in rated interest at a computer terminal. In addition to sentence recall, two measures of attention were recorded. These were sentence reading time and time to respond to a secondary task, which may be supposed to reflect duration and intensity of attention, respectively (Anderson, 1982).

In the secondary task, beeps sound through earphones the child is wearing. The child has a finger resting lightly on a key. When the child hears a beep he or she is supposed to press the key as quickly as possible. The conventional assumption is made that when the mind is occupied with the primary reading task there will be a delay in responding to the secondary task.

A sentence has to be processed to some level before a reader can determine that it is interesting. Ideally, therefore, one would want to place the "beep" toward the end of the sentence. However, there is a problem in placing probes since reading is intrinsically self-paced and there are large individual differences in reading speed as well as stable and not so stable changes in rate over the course of a reading task. What we did

was program the computer to keep a running average of each child's reading speed. Based on this average, probes were placed so that they would sound when the child was an estimated 67% of the way through a sentence. In practice, probes generally sounded when the child was 45% to 90% of the way through the sentence. Present technology did not permit us to place probes closer to the ends of sentences while keeping the probes within the boundaries of sentences with sufficient reliability.

The obvious first entailment of a theory which says that interest increases attention which, in turn, increases learning is that the measure of interest must be related to the measures of attention. And so it is. In the first experiment, for each unit increase in rated interest, there was a 12 millisecond per syllable increase in reading time after discounting irrelevant but possibly confounding factors. For a sentence of average length, this amounts to about 170 milliseconds per sentence, a highly significant result. There was also a 44 millisecond increase in probe time for each unit increase in interest, again a significant result. The interest scale had a range of two and a half units. Thus, there was around a 100 millisecond increase in probe time and about a 400 millisecond increase in reading time per sentence from the least interesting to the most interesting sentences. Similar results were obtained in a second experiment which differed from the first in several ways that turned out not to be important. For each unit increase in

interest there was a 66 millisecond increase in reading time for an average sentence and a 34 millisecond increase in probe time, both significant increases.

The second entailment of the theory is that interest is positively associated with learning. We have already indicated that it is. Specifically, for each unit increase in interest there was a 5.3% improvement in the measure of learning in the first experiment and a 9.4% improvement in the second experiment.

At this point it would be standard practice to conclude that we have confirmed the model which places attention on the causal path between interest and learning. However, more stringent tests of the model are possible and certainly desirable. Thus, we checked a third and a fourth entailment of the model.

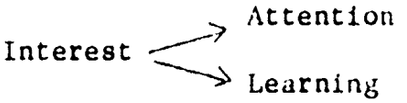
The third entailment is that, if the model is valid, then the measures of attention ought to be positively related to the measure of learning. In each of the two experiments, both measures of attention had positive relationships with learning, but with one exception the relationship was small and nonsignificant. The exception was the reading time measure in the first experiment. Here there was a 4.2% increase in sentence recall for each additional 100 milliseconds of reading time.

The fourth and the most important entailment is that if interest affects learning because, and only because, it affects attention, then when the influence of attention on learning is factored out, the relationship between interest and learning

ought to disappear. This entailment was checked in a hierarchical regression analysis of the entire matrix of subject by sentence recall scores from which between-subject variance had been removed. Entered first were potentially confounding factors such as sentence length, frequency of usage of the words, and serial position of the sentences. Then came the reading time measure and the probe time measure and, finally, rated interest.

What happens to the relationship between interest and learning when variation due to attention is removed? The astonishing answer--at least the result astonished us when it first appeared--is that the relationship does not change! In the first experiment, when attention was factored out, there was a trivial decrease in the proportion of variance explained by interest, and the increase in sentence recall per unit increase in interest dropped only .5%, from 5.3% to 4.8%. In the second experiment, factoring out the measures of attention had absolutely no effect on the association between interest and learning.

Evidently, the deflection in measures of attention is an epiphenomenon insofar as the relation between interest and learning is concerned. The actual relationship is represented in the diagram below rather than the diagram presented earlier:



The pattern of results recapitulated here may seem unfathomable to investigators accustomed to dealing with data aggregated by subject or sentence. Descriptively, what happened is that the sets of interesting sentences that subjects learned better overlapped only modestly with the sets of interesting sentences to which they paid more attention. What that may mean, as one of us has expressed it before (Anderson, 1982, p. 301), is that "the pause to savor an interesting sentence is not the pause that supports the process that gives birth to learning."

Alternative Explanations

Are there any reasons to doubt the conclusions that have been reached so far? One worry is that there are flaws in the paradigm for evaluating the theory that attention is on the causal path between interest and learning. However, we have evidence that the paradigm is sensitive enough to confirm a causal theory. Reynolds and Anderson (1982) had subjects read a 48-page marine biology text. Periodically they were asked questions about an easily identifiable type of information, for instance, questions that always required a number as the answer. The results indicated that subjects learned more information of the type that the questions were about, spent more time reading sections of the text containing question-relevant information, and took more time to respond to a secondary task while reading these sections. The two measures of attention were positively related to learning; and, when attention was factored out, the

relationship between questions and learning was sharply attenuated.

Thus, a model placing attention on the causal path between questions and learning was strongly supported. Apparently the paradigm works. This increases one's confidence that if attention were responsible for the effects of interest on learning the experiments summarized in the preceding section would have revealed that fact.

Converging evidence that attention is not responsible for the effects of interest comes from the experiments summarized earlier that failed to find interactions between interest and a depth-of-processing manipulation or between interest and whether the child was playing an active role in the reading group. One might suppose that these factors increased breadth or depth of attention. Therefore, if interest were having its effect by increasing breadth or depth of attention, the joint effects of interest and the other two variables would be at least partially redundant; and, if the effects were redundant, interactions would have appeared. Thus, the fact that interest does not interact with either of these variables suggests that interest is affecting a different stage or aspect of processing.

Another worry is that some other property of the sentences instead of interest is responsible for the effects that have been observed. It might be proposed that rated sentence interest was associated with ease of assimilation to a familiar schema or with

degree of semantic integration, and that it was one of these properties that produced the effect on learning. Schema familarity is an unlikely explanation because novelty of content is associated with higher rated interest, as we will document later. For instance, the unusual The boy washed the dishes in the bathtub will be rated higher than the commonplace The boy washed the dishes in the sink.

A measure of semantic integration was included in all four of the interest experiments. It consisted of the mean rating of an independent group of judges of the degree of association between the subject noun phrase of a sentence, which served as the cue for recall, and the rest of the sentence. This factor had a very strong relationship with learning; however, it was unrelated to interest. The relations of interest to learning and to attention did not change when the association between the subject noun phrase and the rest of the sentence was factored out.

Other properties of the sentences that might be proposed as rivals to an interpretation in terms of interest are concreteness or likelihood of evoking an interactive image. However, a contrastive analysis of the sentences suggests that the uninteresting ones are as palpable and image-evoking as the interesting ones. For instance, there is nothing at all ineffable about The tall farmer put the book on the shelf after it fell off the table, but third and fourth graders rate it as

dull, and they will neither pay much attention to it nor learn it well.

The interaction of the differential interest of a sentence to boys and girls and the sex of the child is completely mysterious when viewed from the perspective of the imagery proposal. On the other hand, why girls, but not boys, learn The sleepy girl did not want to pick up her party dress which was lying on the floor, and why boys, but not girls, learn The bad boy hid in the basement when he broke the window is readily understandable, if interest is considered to be the operative factor.

Finally, we can report some anecdotal evidence that it is interest--the capacity to evoke an emotional response--that is the functional property of these sentences. Even in the situation in which the child is sitting at a computer terminal, wearing earphones, supervised by a strange adult, we see and hear obvious expressions of emotion. Oooh's, ah's, chortles, and giggles are heard when the children read sentences they find scary, impressive, or funny.

Factors Contributing to Sentence Interest

Up until now interestingness has been defined operationally as whatever children rate as interesting. At this point, we shall attempt to dig deeper and ask what attributes of written materials contribute to interestingness. At least four attributes can be hypothesized to be involved in the

interestingness of sentences. These same factors, and other more subtle ones, may contribute to the interest of stories.

Character identification. People are likely to be interested in material involving characters with whom they readily identify. Identification probably is enhanced if the character matches the reader in terms of sex, age, race, religion, occupation, life situation, temperament, and so on. In the limiting case, the character is the reader. At the other extreme, there is no animate being with which to identify, as in The bag of potatoes was on the shelf. Contrast the interest of that sentence with the following one for an athletic third grader: The strong third grader put the bag of potatoes on the shelf.

No a priori grounds are evident for distinguishing which dimensions of similarity between character and reader are most important. Thus, it is hard to predict the relative likelihood that a child will identify with, say, adult humans and young animals.

Probably the typical child identifies most readily with characters who are Trustworthy, Loyal, Helpful, Friendly, Courteous . . . . Children who regard themselves as deviant may be exceptions to this rule. It seems possible that boys, in particular, may sometimes identify with bad characters.

Novelty. Ordinary happenings are boring while the out of the ordinary can be exciting. This observation leads immediately

to the prediction that unusualness of content will enhance interest, as it seems to do in the sentence about the boy washing dishes in the bathtub included earlier. In that case, the theme of the sentence was dull. Our conjecture, though, is that novelty will add interest even to thematically engaging sentences. If the hypothesis is correct, a third grade boy who was quite interested in The policeman shot the criminal with a gun would be even more interested in The policeman ran over the criminal with a bulldozer.

Topic. In common parlance, we speak of a girl with "an interest" in speed skating or a boy with "an interest" in model airplanes. These illustrate what we mean by topic. The straightforward hypothesis is that children will be interested in material about topics that are important to them.

We will not try to present a taxonomy of interesting topics. There is no shortage of attempts to construct taxonomies in the voluminous literature on children's "reading interests," but, somehow, they seem to be at the wrong level of discourse. They include categories such as "adventure" and fantasy," which might be helpful to a librarian trying to arrange books on a shelf, but which are of little use for our purpose.

The usual starting point for the development of a list of interesting topics is the analysis of popular children's books. One problem with this approach is that it over-represents children who are avid readers. The themes important to less

frequent readers may be slighted, and one reason these children read less may well be that they do not come across books that interest them.

Activity level. It may be supposed that material that depicts intense action or feeling is more interesting than material that depicts passive states or static scenes. For instance, compare The good student ran to the library for some books with The student went to the library for some books.

The four factors that have just been sketched were investigated to determine whether they do contribute to interest. Sentences written so that the factors were independent of one another were rated for interest by a representative sample of third graders. Novelty of content and centrality of the topic to third graders accounted for 47% and 21% of the variance, respectively, in the mean ratings of the children. Otherwise, none of the hypothesized effects was evident. Whether the subject of a sentence was animate, human, male, or female made no difference. Contrary to expectation, the children actually had a small but significant preference for sentences with adult rather than child characters. Intensity of action made no difference. None of the variables interacted with the gender of the children who did the rating; in particular, there was no hint of an interaction between whether the character was male or female and the gender of the children. It should be noted that here the sentence topics used in this study were not strongly sex typed.

What Makes an Interesting Story?

Children's stories are currently the subject of active research in education and psychology. Most investigators are concerned with the structure of the story schema and how it influences comprehension and memory; they pay little attention to what makes stories interesting. Notable exceptions to this pattern are Brewer and Bruce, and their respective colleagues.

Brewer and Lichtenstein (1982) have proposed what they call a "structural-affect" theory of stories. Their basic idea is that stories are a subclass of narratives whose primary purpose is to entertain and, further, that a story is entertaining only if it arouses affect. Empirical tests of the theory confirm that people will not call a narrative a story unless it produces an emotional response.

Jose and Brewer (in press) evaluated a developmental model of factors that contribute to the interest of suspense stories. According to the model: (a) reader identification increases with greater perceived similarity between character and reader; (b) increased identification leads to greater suspense; (c) liking for the outcome of a story is a joint function of whether the character is good or bad and whether the story has a happy or an unhappy ending; and (d) overall story liking increases with greater identification, greater suspense, and greater liking of the outcome. The model was tested by having second, fourth, and sixth graders rate suspense stories on ten affective scales.

Jose and Brewer attempted to manipulate character identification by writing alternate versions of stories in which the principal character was a child (of indeterminate age) or an adult, male or female, good or bad. The factor that proved to be of overriding importance was whether the character was good or bad. Children of each age, but particularly the younger ones, rated nice characters as more similiar to themselves, they identified more readily with nice characters, and they liked stories with nice characters better. Matches between the reader and the character with respect to age and gender did not contribute substantially to ratings of similarity, character identification, or story liking until the child was in the sixth grade. Thus, the results were not inconsistent with the results of the study of sentence interest summarized in the preceding section.

Jose and Brewer claim that suspense is not due merely to uncertainty about the outcome of a story. They illustrate this with the case of someone who discovers a damp book of matches in a forest. Uncertainty as to whether a match from the book will strike does not by itself cause suspense, but if the someone is a hiker lost in a blizzard then the uncertainty would be likely to produce suspense, since the match's lighting has a significant consequence for the character. Additionally, Jose and Brewer argue that suspense is heightened when the reader cares about the character. This latter aspect of the theory was evaluated in the

study. Increased character identification did increase suspense at all grades, but increased suspense was associated with greater story liking for only the fourth and sixth graders.

Jose and Brewer concluded that a simple model will explain the story preferences of second graders: They like stories with nice characters and happy endings. By the time they have reached the sixth grade, though, children are ready to abandon Pollyanna in favor of a Just World: They enjoy either stories in which good characters experience good outcomes or ones in which bad characters get their just deserts.

Bruce (1983; also Steinberg & Bruce, 1980) has analyzed a large number of stories using concepts drawn from rhetoric and cognitive science. Stories from three basal reading series were compared with stories from children's trade books. Basal stories less often involved interpersonal or internal conflict. They were more often written from a detached impersonal point of view and less often involved a narrator engaged in the events of the story. Basal stories less often gave an "inside view" that directly revealed the thoughts, feelings, and plans of characters. These trends were especially pronounced in stories intended for children in the early grades. The percentages of primary level basal stories exhibiting low conflict, low inside view, and a detached observer point of view were 63.3%, 66.7%, and 26.7% for the three basal series, but only 13.3% for the stories from tr books.

Bruce maintains that the features that he has examined are important for the child's identification with characters and enjoyment of stories. He also claims (1983, pp. 170-171) that,

> Another aspect of reader involvement should not be underrated: More engaging stories may interest adults (parents, teachers, and so on) more; their interest or disinterest will be communicated to children. It is not surprising that many of the enduring children's stories, e.g., Hansel and Gretel, can be shown to have complexities that allow multiple levels of interpretation. (See Bettelheim, 1976, and Bruce & Newman, 1978)

Bruce has not collected data that directly show that children prefer material with more interpersonal and internal conflict, greater inside view, and more engaged narration; however, Steinberg and Bruce (1980) found that adults prefer children's stories with these features. Moreover, most of the trade books Bruce has examined are known to be popular among children. About 60% were on the Children's Choices lists compiled on the basis of children's preferences by the International Reading Association together with the Children's Book Council and published each fall in the Reading Teacher.

Interestingness of Social Studies and Science Textbooks

While criticisms of made-for-school stories, such as those leveled by Bettelheim and Zelan (1982), have received the lion's share of public attention, school textbooks are if anything more dismal. Anderson and Armbruster (1984; see also Kantor, Anderson, & Armbruster, 1984) have concluded on the basis of an examination of a large number of selections from social studies and science textbooks that these texts typically lack coherent organization. In the worst cases, the treatment of a topic consists of little more than a list of vaguely related facts.

It is a common practice to sprinkle colorful vignettes into children's social studies and science texts (see Pearson, Gallagher, Goudvis, & Johnston, 1981, and Hidi, Baird, & Hildyard, 1982). This is done to make what is regarded as dull material more interesting, but ironically it appears to be a major reason why textbooks lack coherence. For instance, Armbruster and Anderson (1984) analyzed the material in several fifth grade history books on the building of the transcontinental railroad. None of the selections made clear information that Armbruster and Anderson theorize is essential in historical explanation, namely in this case the country's goal in building the railroad, the plans for achieving the goal, or the outcome of the effort in terms of the goal. But every selection featured the information that on May 10, 1869 in Promontory, Utah

Governor Leland Stanford missed in his first attempt to hit a golden spike with a hammer.

Apparently the theory that guides the writing of children's textbooks is that interesting asides will attract attention; and once attracted, attention will be maintained for awhile, leading to better learning of the surrounding, less interesting material. Anderson, Mason, and Shirey (in press) tested this theory in one of the studies of sentence interest already reviewed. They investigated the influence of the interest of a sentence on the learning of the sentence that immediately followed it in the list. There was absolutely no effect. They also examined the influence of the interest of a sentence on the learning of the sentence that immediately preceded it. Again, there was no effect. Thus, there was no support for the idea that an interesting but unrelated piece of information will improve the learning of surrounding information. Obviously this conclusion will need to be checked with life-like material, but in the meantime there is reason to be suspicious of current formulae for writing and editing textbooks.

Summary

In summary, first, the interestingness of children's reading material has strong and pervasive effects on learning. Second, interesting material attracts attention. However, this does not seem to be the reason it is learned better, contrary to what would be expected on the basis of either common sense or

psychological research. Third, promising theories of what makes written material interesting to children are emerging and are being subjected to empirical test. Fourth, basal readers and textbooks for children often do not have features that would arouse and hold a child's interest, or do have features intended to create interest that may be counterproductive.

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